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JC564 U.S. PTO
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PATENT APPLICATION

Asawaree P Kalavade

CASE 4

TITLE Method And Device For Generating A PCM Signal Stream From A Streaming Packet Source

ASSISTANT COMMISSIONER FOR PATENTS
WASHINGTON, D.C. 20231

SIR:

NEW APPLICATION UNDER 37 CFR § 1.53(b)

Enclosed are the following papers relating to the above-named application for patent:

Specification
[12] Formal Sheets of drawing(s)
[1] Assignment(s) with Cover Sheet
Declaration and Power of Attorney

CLAIMS AS FILED				
	NO. FILED	NO. EXTRA	RATE	CALCULATIONS
Total Claims	40 - 20 =	20	x $18 =	$360
Independent Claims	8 - 3 =	5	x $78 =	$390
Multiple Dependent Claims, if applicable			+ $260 =	$0
Basic Fee				$690
			TOTAL FEE	$1440

Please file the application and charge **Lucent Technologies Deposit Account No. 12-2325** the amount of $1440, to cover the filing fee. Duplicate copies of this letter are enclosed. In the event of non-payment or improper payment of a required fee, the Commissioner is authorized to charge or to credit **Deposit Account No. 12-2325** as required to correct the error.

The Assistant Commissioner for Patents is hereby authorized to treat any concurrent or future reply, requiring a petition for extension of time under 37 CFR § 1.136 for its timely submission, as incorporating a petition for extension of time for the appropriate length of time if not submitted with the reply.

Please address all correspondence to **Docket Administrator (Room 3C-512), Lucent Technologies Inc., 600 Mountain Avenue, P.O. Box 636, Murray Hill, New Jersey 07974-0636**. However, telephone calls should be made to me at 732-949-6559.

Respectfully,
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METHOD AND DEVICE FOR GENERATING A PCM SIGNAL STREAM FROM A STREAMING PACKET SOURCE

CROSS REFERENCES TO RELATED APPLICATIONS

This application claims the benefit of U.S. Provisional Application No. 60/180,245, filed on February 4, 2000. The application is related to another U.S. Patent Application, having a filing date of March XX, 2000, and Serial No. XX/XXX,XXX, entitled "Media Gateway Appliance," (Kalavade 5).

FIELD OF THE INVENTION

The present invention relates to the processing of a streamed media source, especially applicable for audio signal streaming over a circuit-switched service connection.

BACKGROUND OF THE INVENTION

Streaming is a technique for breaking up a media file into packets and sending those packets to the user in sequence, via a packet network such as the Internet or intranet. A receiving computer is able to play the data when it arrives, instead of waiting for the entire file to download. Audio streaming is an extremely popular application on the Internet today, as evidenced by the immense popularity of music and other audio content in the MP3, RealAudio, and Microsoft Media formats. With the increasing proliferation of cellular users, and the trend towards ubiquitous services, it is believed that there could also be an enormous demand for similar streaming applications to cellular phone users, should such capability be developed. A recent study by Arbitron found that over 75% of polled web users expressed interest in portable streaming services, saying they would increase their tuning into streaming programs if these services were available on portable devices.

Audio streaming over the Internet uses a packet-based approach, where the audio source is broken down into packets, each packet is encoded, and sent to the receiving client in sequence. The client receives the packets, decodes them, and plays them out on the receiving terminal. Unfortunately, cellular systems today cannot offer such Internet-style packet-based audio streaming due to limitations at the terminal (client cell phone) and due to limitations of the infrastructure. For example, cellular phones can not support streaming since they do not have decoders (e.g. mp3 decoder) or streaming controls (skip, pause, etc.). Additionally, data rates over the cellular networks today are quite limited and are insufficient to transport encoded streaming packets.

SUMMARY OF THE INVENTION

These and other limitations associated with the prior art are overcome by the present invention which receives packets streamed over a packet network, decodes the packets received to generate a decoded signal stream and filters the decoded signal stream to generate a pulse code modulated (PCM) signal stream. The PCM signal stream may be tailored to conform to the target destination transport requirements, including call channels established over circuit-switched networks, whether wired or wireless, without requiring modification of the capabilities associated with the network infrastructure or the client phone.

BRIEF DESCRIPTION OF THE DRAWINGS

A more complete understanding of the present invention may be obtained from consideration of the following description in conjunction with the drawings in which:

FIG. 1 illustrates an exemplary application of a Media Gateway Appliance (MGA) used to generate a Pulse Code Modulated (PCM) audio signal stream for delivery to a client cellular phone via a wireless network, in accordance with the principles of the present invention;

FIG. 2 is a high-level flow diagram illustrating the MGA's function as a gateway between the Internet and the cellular network of FIG. 1, in accordance with the principles of the present invention;

FIG. 3 is a high-level, functional block diagram of one embodiment of the MGA, in accordance with the principles of the present invention;

FIG. 4 is a block diagram of the architecture of one embodiment of the MGA, in accordance with the principles of the present invention;

FIG. 5 is a flow diagram illustrating one embodiment of a user interface process, in accordance with the principles of the present invention;

FIG. 6 is a functional block diagram of one embodiment of the MGA, in accordance with the principles of the present invention;

FIG. 7 is a flow diagram illustrating one embodiment of a Service Control Module's processes, in accordance with the principles of the present invention;

FIG. 8 is a flow diagram illustrating one embodiment of a Session Control Module's processes, in accordance with the principles of the present invention;

FIG. 9 is an illustration of an exemplary embodiment of the mapping of the Audio Session Gateway Protocol (ASGP), in accordance with the principles of the present invention;

FIG. 10 is a flow diagram illustrating the cell casting processes for one exemplary embodiment of the present invention;

FIG. 11 is a block diagram of one embodiment of a Media Translation Module, in accordance with the principles of the present invention;

FIG. 12 illustrates an exemplary application of the MGA used in conjunction with Wireless Application Protocol (WAP) functionality, in accordance with the principles of the present invention; and

FIG. 13 is a flow diagram illustrating the MGA's function as a gateway between the Internet and the WAP cellular network of FIG. 12, in accordance with the principles of the present invention.

DETAILED DESCRIPTION

Although an embodiment of the present invention is illustrated and described herein as a method and device for accessing Internet audio content provider sources and for converting packet-based streamed audio to a Pulse Code Modulated (PCM) audio signal stream for delivery to a cellular network service provider's client cell phone over a circuit-switched connection, the embodiment is merely illustrative for the purposes of teaching and describing the principles of the present invention and should not be construed as being so limited. The present invention is equally applicable to any device and method for conversion of packet streamed media to a PCM signal stream, regardless of the source packet network type and regardless of the source media file and transport format, and irrespective as to whether the PCM signal stream is delivered to a wireless client's cell phone, a wire-line phone, or via any circuit-switched connection whatsoever.

Referring to FIG. 1, a Media Gateway Appliance (MGA) 120 is shown interposed between a mobile switching center (MSC) 150 of a cellular network 170 and a content provider server 140. Internet Protocol (IP) sessions between the MGA 120 and the content provider server 140 are accomplished over the Internet 160. A cellular network's client cell phone 130 is shown accessing the MSC 150 via the cellular network 170 to establish a wireless circuit-switched connection with the MGA 120. The present invention is agnostic with respect to the various cellular modes and standards, and is compatible with all cellular air interfaces, including, but not limited to Groupe Speciale

Mobile (GSM), Time Division Multiple Access (TDMA), Code Division Multiple Access (CDMA), and Advanced Mobile Phone Service (AMPS).

Furthermore, the instant embodiment illustrates the MGA 120 as interfacing the Internet 160 and the cellular network 170, but the MGA 120 is not shown as included within either network. Those skilled in the art would appreciate that the MGA 120 may be implemented in either network while still adhering to the principles of the present invention. In fact, special value may be extracted by incorporating the MGA 120 within either network. For example, incorporating the MGA 120 within the cellular network 170 adds value inuring to the wireless service provider since the provider may: (*i*) choose to charge additional subscriber fees for client's use of wireless audio (or other media) streaming services, (*ii*) choose to offer the additional streaming services to entice prospective subscribers away from competitor providers, or both. Alternatively, value may be extracted from MGA 120 services if the MGA is implemented within an Internet domain server as well, whether in conjunction with the content provider server 140 or in conjunction with a third-party server (not shown). Including wireless media streaming services is of value to web-sites, since it will result in more site hits and attract greater numbers of visitors and clients.

The MGA 120 acts as a gateway between the cellular network 170 and the Internet 160. In an exemplary embodiment of the present invention, a client cellular user requests MGA 120 media streaming services by initiating a call to an MGA 120 service telephone number. The MGA 120 is responsible for: (a) establishing a session on the Internet 160 in response to the call request, (b) retrieving packet-based streaming audio content from the content provider server 140, (c) decoding the packet-based streaming audio content, and (d) translating it to a 64 kbps PCM signal stream. The decoded and translated PCM signal stream is then delivered to the client cell phone 130 over a standard

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speech channel using the underlying services in the cellular network. Therefore, the MGA 120 leverages the circuit-switched ("speech") channel in the cellular network 170 to deliver streaming audio from the MSC 150 to the client cell phone 130. Streaming session control and decoding is performed at the MGA 120. Thus, audio and other media content can be played out utilizing existing cell phones, phones which don't include decoders or streaming audio players. Second, the content is played out over a speech channel. Therefore, special high-bandwidth circuit-switched connections to the cellular network 170 are not required. Since the cellular network 170 receives the audio content from the MGA 120 via a circuit-switched connection, mobility, transport and delivery issues are not encountered. In addition, because the MGA's 120 output signal stream is typically 64kbps PCM, it can be connected directly to the MSC 150, either by co-locating the MGA 120 within the cellular service provider premises, or alternatively, via a direct digital connection into the MSC 150. Such a configuration makes the MGA 120 simple to deploy since changes are not required in the cellular service provider's infrastructure. Thus service providers may use the MGA to deploy audio signal streaming, a next-generation wireless service, while still leveraging their infrastructure.

A high-level description of one embodiment describing the MGA's 120 function as a gateway between the Internet 160 and the cellular network 170 may be had by referring to FIG. 2. The client user initiates a media streaming session by requesting service (210). The user begins this process by dialing a phone number from the client cell phone 130 corresponding to the MGA 120. The servicing MSC 150 establishes a connection between the client cell phone 130 and the MGA 120 (220). Once the incoming call is received, the MGA 130 forwards options to the user and solicits a response (230), typically via voice announcement indicating a choice of selections with a request that the user select and press a digit corresponding to her desired selection. Other options for information exchange between the MGA 120 and the user are also well-known and would be apparent to those skilled in the art, two such examples being solicitation and/or response via text or voice messages. The request to the user for option selections is presented within an MGA 120 service presentation layer.

One embodiment of the present invention solicits user response regarding web-site content provider, type and/or genre of music, etc. The MGA 120 provides three types of media streaming services, including: (*i*) web-casted live content, for example, Internet radio provided by content providers such as SHOUTcast.com or Broadcast.com, (*ii*) on-demand content providers such as RealNetworks, MP3.com or any of a myriad of web-sites which maintain archived media files at their servers, and (*iii*) profile playback, which allows users to maintain a user profile database at the MGA 120 server, the profile being used to select content for playback to the client cell phone 130.

The user selects her desired options using the client cell phone 130 (240). Once the user selected options are received at the MGA, the MGA establishes a session with the content provider server 140 (250), and the content provider server 140 begins streaming packets to the MGA 120 (260). The MGA 120 decodes the received packet-based streamed audio and translates to a PCM signal format (270). The MGA 120 then delivers the PCM audio signal stream to the client cell phone 130 via the established circuit-switched connection (280).

FIG. 3 is an exemplary illustration of the function and interrelationship of the main functional components of the MGA 120 on a per call connection basis. In one illustrative embodiment of the present invention, the MGA 120 is comprised of three functional components: (*i*) the service control function 310, (*ii*) the session control function 320, and (*iii*) the media translation function 330. The service control function is used as an interface with the call connection established over the circuit-switched cellular network 170. The service control function 310 presents the various service control options to the client cell phone 130, processes requests for service, and processes playback commands. The service control function 310 information exchange with the user may be presented in several formats, including, but not limited to, such illustrative examples as standard interactive voice response (IVR), wireless application protocol (WAP) interface, or VoiceXML (VXML). The session control function 320 is used to interface the MGA 120 with the Internet 160. The session control function 320 establishes and controls sessions with the content provider server 140. The session control function 320 also implements a protocol for converting the client cell phone 130 into a virtual personalized player by translating playback control requests from the client into session commands routed to the content provider server 140. This protocol is called an Audio Session Gateway Protocol (ASGP), and will be described in more detail later in conjunction with FIG. 9. The media translation function 330 receives packet-based streamed audio files over the Internet 160, and decodes and converts the packet-based streamed audio files into a PCM audio signal stream compatible for delivery over a circuit-switched voice channel to the client cell phone 130.

As shown in FIG. 4, the MGA 120 includes a central processor (CPU) 405, random access memory (RAM) 410, read only memory (ROM) 420, clock 425, packet network interface 430, circuit-switched line interface 435, and data storage device 440. A conventional personal computer or computer workstation with sufficient memory and processing capability may be used as the MGA 120. Data storage device 440 may include hard disk magnetic or optical storage units, as well as CD-ROM drives or flash memory. Data storage device 440 contains applications and databases used for the implementation of the present invention, including: MGA application software 450, WAP server

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application software 455, web server application software 460, content caching software 465, user profile database 470, recorded audio database 480, and live channel directory database 490. WAP server application software 455 is optionally included for use in delivery of web page content from the content provider server 140 to the client cell phone 130. Content caching software 465 is implemented optionally for local storage content at the MGA 120 for repeatedly accessed Internet 160 media files, so that content that is repeatedly accessed does not require repeated downloads from the Internet 160.

The user profile database 470 includes information associated with a client, including, for example, user preferences and/or client cell phone number. In one embodiment of the present invention, user data may be entered in the user profile database 470 utilizing the keypad on the client cell phone. In another embodiment of the present invention, user data may be entered in the user profile database 470 from a personal computer or other information appliance accessing the web (not shown) to use the optional web server application software 460 at the MGA 120. Thus user profile database 470 entries may be created or edited without the benefit of an established connection between the client cell phone 130 and the MGA 120. Recorded audio database 480 is a portion of the data storage device 440 in which the user may store audio files which the user has selected. The live channel directory database 490 is a portion of the data storage device 440 in which information pertaining to available live content channels is maintained at the MGA 120.

Packet network interface 430 is utilized as an interface to the Internet 160. Any appropriate interface may be used, such as an Ethernet interface, as would be known to those skilled in the art. Circuit-switched line interface 435 is utilized as the interface to the cellular network 170. Similarly, such interfaces are also well-known to those skilled in the art.

Referring now to FIG. 5, there is shown a flow diagram illustrating an exemplary embodiment of the service control function 310 interfacing sequence with the client cell phone 130 user. The client user initiates a media streaming session by requesting service (510). The user begins this process by dialing a phone number from the client cell phone 130 corresponding to the MGA 120. The service control function 310 for the assigned call connection attempts to identify the client cell phone 130 or a user registration and dips the user profile database 470 to determine if a user profile exists (515). If a user profile does exist, the user profile is then read to return user-selected channel, category, or genre preferences (520). An Internet session with the user-selected content provider server is established and the appropriate content packets are streamed to the MGA 120. The MGA 120 decodes the selected content and translates it to a PCM audio signal stream, which is then launched over the established circuit-switched connection to the client cell phone 130 (525).

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If however, a user profile does not exist, then the service control function 310 queries the user regarding her desired session preferences (530). The user selects her desired options using the client cell phone 130 in response to the query (535). The MGA 120 then determines if the user has requested delivery of live content (540).

If the user desires to listen to live content channels, then the user is presented with a set of scan-mode channels and queried for a selection from the available scan-mode channels (555). Scan-mode channels are identified by a cell cast scan channel module of the MGA 120, described in greater detail in conjunction with FIG. 6. The available scan-mode (or cell cast) channels may be presented to the user in several formats, as would be apparent to skilled in the art. In one embodiment of the present invention, audio samples from each of the available scan-mode channels are multiplexed in short audio segments, so that a user can listen to sequential segments of available audio content. One alternative method for scan-mode channel presentation to the user is to forward content playlist or genre text to the user. Once available scan-mode channels are presented, the user responds by selecting a scan-mode channel (560). The user's response is collected via the service control function 310 by any number of well-known alternative collection means, including by way of example, but not limitation, dual tone multi-frequency (DTMF) digit collection, text message recognition, or voice recognition. Once the user has selected a scan-mode channel, the content of the selected scan-mode channel is launched over the established circuit-switched connection to the client cell phone 130 (525).

If however, the user does not desire to listen to live content channels, but rather wishes to invoke on-demand mode channels, then the user is presented with options, typically via voice announcement (545). In one embodiment of the present invention, the options presented may be as to type or genre of audio content desired; such as "Press 1 for classical," Press 2 for jazz," etc. The client cell phone 130 user then selects the desired option (550). The user's response is collected via the service control function 310 by any number of well-known alternative collection means, including by way of example, but not limitation, dual tone multi-frequency (DTMF) digit collection, text message recognition, or voice recognition. Once the user has selected a content option, the selected content is fetched, decoded, translated, and launched over the established circuit-switched connection to the client cell phone 130 (525).

Playback controls are asynchronously enabled (565). Playback controls are available to the client cell phone 130 user to perform various playback and control functions. These are functions typically associated with any audio playback device. Such controls include, by way of example and not limitation, fast forward, reverse, play, record, pause, resume, stop, skip, channel select, mute, etc. Playback control commands are divided into two general types: content altering commands and non-content altering commands (570).

Non-content altering commands include those commands in which the content provided to the MGA 120 from the content provider server 140 is to remain unchanged; that is, the user has not selected an alternate media channel for the MGA 120 to stream. Content altering commands include those in which the content provided to the MGA 120 from the content provider server 140 is to be changed; that is, the user has selected an alternate media channel for the MGA 120 to stream.

Referring now to FIG. 6, a functional block diagram of one embodiment of the MGA 120 is presented. Functionally, the MGA 120 includes packet interface 430, circuit-switched line interface 435, call processing interface 610, call channels 620 (a total of $k+n$ call channels shown), cell cast channels 640 (a total of $j+n$ cell cast channels shown), cell casting control module 650, and cell cast scan channel module 660. Greater detail of the functional architecture of an individual call channel 620 may be had by referring to call channel k 620_k, which includes a service control module 622_k, a session control module 624_k, a media translation module 626_k, and a line driver 628_k. Greater detail of the functional architecture of an individual cell cast channel 640 may be had by referring to cell cast channel j 640_j, which includes a cell cast session control module 642_j and a cell cast media translation module 644_j.

When used within the context of the instant description, the word “coupled” is meant to describe the capability of the functional components and modules so coupled to exchange, relay, correlate, impart, and/or otherwise share various messages, data, communications, signaling, media, and signals, regardless of whether the functional components and modules exist as physical devices or as functional constructs of the MGA’s 120 software architecture, and regardless of whether the MGA 120 is implemented in a single computer, distributed over a plurality of computers, or distributed over a plurality of processors and a plurality of data storage devices. Packet network interface 430 is utilized as an interface to the Internet 160. Circuit-switched line interface 435 is utilized as the interface to the cellular network 170. Call processing interface 610 is coupled to: (*i*) the circuit-switched line interface 435, and (*ii*) the service control modules 622 and line drivers 628 of respective individual call channels 620. Service control modules 622 are coupled to respective session control modules 624 and line drivers 628. Session control modules 624 are coupled to the packet interface 430 and the cell casting control module 650. Media translation modules 626 are coupled to the packet interface 430 and respective line drivers 628. The cell casting control module 650 is coupled to the cell cast scan channel module 660 and cell cast session control modules 642. Cell cast session control modules 642 are coupled to the packet interface 430, which is in turn coupled to the cell cast media translation modules 644. Cell cast media translation modules are coupled to the cell cast scan channel module 660, which is in turn coupled to the line drivers 628.

The call processing interface 610 performs the function of receiving and terminating client cell phone 130 call connections and assigning client cell phone 130 call connections to call channels 620. Individual call channels 620 are assigned to each call and are comprised of a service control module 622, session control module 624, media translation module 626, and line driver 628. The service control module 622 performs the service control function 310, which in the instant embodiment of the invention encompasses the illustrative tasks of presenting various service control options to the client cell phone 130, processing requests for service, and processing playback commands. The service control function 310 may utilize any of a number of well-known user interface means, formats, and protocols including, but not limited to, such illustrative examples as standard interactive voice response (IVR), DTMF digit detection and collection, voice recognition, text messaging, wireless application protocol (WAP) interface, or VoiceXML (VXML). The session control module 624 performs the session control function 320, which in the instant embodiment of the invention encompasses the illustrative tasks of maintaining an Internet 160 interface, establishing and controlling Internet sessions with the content provider server 140, implementing the AGSP for converting the client cell phone into a virtual personalized player by translating playback control requests from the client into session commands routed to the content provider server 140. The media translation module 626 performs the media translation function 330, which in the instant embodiment of the invention encompasses the illustrative tasks of receiving packet-based streamed audio files over the Internet 160, and decoding and converting the packet-based streamed audio files into a PCM audio signal stream compatible for delivery over a circuit-switched voice channel to the client cell phone 130. In accordance with the instant embodiment of the invention, the line driver module 628 receives the PCM audio signal stream from the media translation module 626 and launches the audio content for the respective call channel to the client cell phone 130. The line driver module 628 also receives inputs from various processes, including playback options from the session control module 622, on-demand data from the media translation module 626, and live content, scan-mode channels and live channel directory information associated with cell cast channels 640.

In the case of live content, the MGA 120 is designed to support the multi-casting of a single PCM audio signal stream to a plurality of users, that is to one or more client cell phones 130, without requiring the replication of resources on a per call channel 620 basis for each call connection to each client cell phone 130. I call this mode of multi-casting "cell casting." Cell Casting reduces the bandwidth and processing overhead when a plurality of clients want to listen to the same content. In accordance with the instant illustrative

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embodiment of the invention, cell casting is supported by the MGA 120 in the following manner. The cell casting control module 650 establishes content sessions with one or more Internet broadcast channels over the packet interface 430. The cell casting control module 650 maintains a list of each of the sessions established and the cell cast channels 640 through which corresponding session data is processed, the content provider server address 140, and the group of client users currently subscribing to each of the cell cast channels 640. Each cell cast channel 640 is comprised of a cell cast session control module 642 and a cell cast media translation module 644, with functionality replicating the functionality of individual call channel's similarly-named session control modules 624 and media translation module 626. The cell cast scan channel module 660 provides the previously described scan-mode channel presentation for a client cell phone 130 user. That is, if a user desires to listen to live content channels, then the user is presented with a set of scan-mode (or cell cast) channels and queried for a selection from the available scan-mode channels. Scan-mode channels are identified by the cell cast channel module and presented to the user in any of several formats, as would be apparent to those skilled in the art. In one embodiment of the present invention a scan-mode channel presentation format which is thought to be especially useful, in the context of delivery of PCM audio signal stream to a client cell phone 130, is to provide audio samples from each of the available cell cast channels 640 which are multiplexed in short audio segments, so that a user can listen to sequential segments of available audio content. Upon hearing a short audio segment which the user desires to have delivered, the user selects the desired audio content and the MGA 120 delivers a PCM audio signal stream corresponding to the selected cell cast channel 640 content. As previously described, it would be apparent to those skilled in the art to provide other well-known alternative presentation types and methods representing the

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available cell cast channels 640. Once available cell cast channels 640 are presented, the user may respond by selecting a particular cell cast channel. The user's response is collected via the service control function 310 by any one of a number of well-known alternative collection means, including by way of example, but not limitation, dual tone multi-frequency (DTMF) digit collection, text message recognition, or voice recognition. Once the user has selected a cell cast channel 640, the content of the selected cell cast channel 640 is launched over the established circuit-switched connection to the client cell phone 130.

FIG. 7 is a flow diagram showing the processes performed by a service control module 622 in an illustrative embodiment of the present invention. Although the processes described in conjunction this and subsequent figures are directed towards call channel k 620_k and cell cast channel j 640_j, the processes are representative of other channels as well, and apply equally to any call channel 620 and any cell cast channel 640. Upon initiating a call for service to the MGA 120, service control module 622_k receives and parses user-identifying information pertaining to the user's client cell phone 130 via the call processing interface 610 (710). Such information may be determined through the use of user-supplied per-call information, recalled stored data ascertained by association with Caller-ID data, or any other means selected from a variety of well-known methods for dial-up user account identification. Service control module 622_k determines whether a user profile exists for the instant caller (715). If so, the service control module 622_k dips the user profile database 470 of the data storage device 440 for pertinent profile data associated with the user allocated to call channel module k 622_k (720). User requirements, as determined by the user profile database 470, are then forwarded to the channel k session control module 624_k (720).

If however, a profile does not exist for the user, then the service control module 622_k queries the user regarding her desired session preferences (730).

Once the user selects her session preferences, those preferences are forwarded and received by the service control module 622_k (735). A determination is made as to whether the user has selected live content as a preference (740). If the user has requested delivery of live content, then a set of scan-mode channels are presented to the user, via call channel k line driver 628_k, to elicit a user response concerning her desired selection of live content (755). For example, in an embodiment of the present invention in which options are presented to the user via voice announcement and the user's response gathered via DTMF digit collection, a presentation script to the user may be as follows: "You are about to listen to audio clips representative of the available live content channels. Each clip is only 5 seconds in length. Please indicate your desired channel by selecting the number '1' on your phone when you hear the content you wish to listen to. The audio clips are looped and will repeat should you miss a selection the first time it is played."

Alternatively, if the user has not requested live content, that is, the user desires content in the on-demand mode, then call channel k line driver 628_k presents the user with various options for on-demand content (745). For example, in an embodiment of the present invention in which options are presented to the user via voice announcement and the user's response gathered via DTMF digit collection, a presentation script to the user may be as follows: "If you wish to listen to news, please push '1' now ... if you wish to listen to classical music, please push '2' now ..."

Regardless of whether live content or on-demand content is selected, the user selection is received by the call processing interface (750) and forwarded to the call channel k session control module 624_k ((725) - go to match point A of FIG. 8).

Playback controls are asynchronously enabled (760). Playback controls are available to the client cell phone 130 user to perform various playback and control functions. These are functions typically associated with any audio playback device. Such controls include, by way of example and not limitation, fast forward, reverse, play, record, pause, resume, stop, skip, channel select, mute, etc. Playback control requirements, when selected, are forwarded to the call channel *k* session control module 624_k ((765) – go to match point B of FIG. 8).

FIG. 8 is a flow diagram showing the processes performed by a session control module 624 in an illustrative embodiment of the present invention. The processes are described in conjunction with call channel *k* 620_k, although they apply equally to the session control module 624 of any call channel 620. Upon receipt of mode requirements from the corresponding service control module 622_k ((810) – from matchpoint A of FIG. 7), the session control module 624_k ascertains whether the requested channel is a live content mode or on-demand mode source (820). If an on-demand mode source is requested, the session control module 624_k initiates and establishes a HyperText Transfer Protocol (HTTP) / Real Time Streaming Protocol (RTSP) session with the content server to provide the requested media file (825). If however, a live content mode source is requested, the session control module 624_k first performs a check to determine whether a cell cast channel 640 is already receiving, decoding and translating the requested source file (830). This step is performed for purposes of efficiency. That is, it would be unnecessary to replicate the establishment of a session, and the decoding, and translating of a streamed packet audio file, if all of those processes were already performed for a user assigned to another call channel(s). Therefore, should it be determined that the requested content source is already being received and processed via a cell cast channel (say cell cast channel *j* 640_j for the purposes of this description), then the cell casting control module adds call channel *k* 620_k to the list of channels being provided content from cell cast channel *j* 640_j, and the

PCM audio signal stream generated by cell cast channel *j* 640_j is delivered to the line driver 628_k associated with call channel *k* 620_k, in addition to the call channels 620 previously assigned (835). If however, no cell casting channel 640 is processing the requested content, then the session control module 624_k initiates and establishes an HTTP/RTSP session with the content server to provide the requested media file (825).

Upon receipt of a playback control requirement from call channel *k* service control module 622_k ((840) – from matchpoint B of FIG. 7), the session control module 624_k converts the playback control requirements utilized by the service control module 622*k* into a format appropriate for the packet streaming content server. The conversion is accomplished utilizing the audio session gateway protocol (ASGP) developed in conjunction with the instant invention (845). In one exemplary embodiment of the present invention, the ASGP converts user selected DTMF digits into command formats appropriate for the content provider server 140 format utilized (i.e. – a command to pause audio playback, although common at the user interface, requires different conversions by the ASGP for different audio content players). FIG. 9 is representative of an ASGP conversion mapping 900 for an exemplary embodiment of the present invention.

The session control module 624_k ascertains whether the requested channel is a live content mode or on-demand mode source (850). If the requested channel is an on-demand mode source, then the playback control requirements converted by the ASGP are forwarded to the content provider server 140 or the media translation module 626_k, as appropriate (855). Differentiation as to whether the ASGP command is forwarded to the content provider server 140 or the media translation module 626_k is determined by the actual command type. For example, certain playback control commands, such as "skip to the next item" or "rewind," control the streaming of packets from the content provider server 140 to the MGA 120 and therefore must necessarily be

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forwarded to the content provider server 140 itself. Other commands, such as volume control changes, are not content or content-delivery altering, and only need to be forwarded to the media translation module 626_k.

If the requested channel is a live content mode source, the session control module 624_k ascertains whether a cell cast channel 640 is already receiving, decoding and translating the requested source channel (860). As before, this step is performed for purposes of efficiency. If the requested source channel content is already being received, decoded, and translated by a cell casting module, then the ASGP format playback control command is forwarded to the cell casting control module (865). If not, then the ASGP format playback control command is forwarded to the content provider server 140 or the media translation module 626_k, as appropriate (855).

FIG. 10 is a flow diagram illustrating the cell casting processes in one exemplary embodiment of the present invention. As previously described, cell casting is a form of multi-casting of a single PCM audio signal stream to a plurality of users, that is to one or more client cell phones 130, without requiring the replication of resources on a per call channel 620 basis for each call connection to each client cell phone 130. Upon receiving user-selected requirements (1010), the session control module 624_k determines whether the user has selected to review the previously described scan-mode channels (1020). If scan-mode is selected, then audio samples from each of the available cell cast channels 640, in the form of short audio segments, are multiplexed by cell cast scan channel module 660 into a single audio stream, and delivered to the call channel *k* line driver 628_k (1040). This single audio stream represents the content from all of the live audio streams multiplexed into one stream, allowing the user to select her choice from the available cell cast channels 640. If scan-mode is not selected, then the selected cell cast channel 640 content (cell cast channel j 640_j in the instant example) is assigned and launched to the call channel k line driver 628_k (1030).

FIG. 11 is a block diagram of a media translation module 626, in accordance with an exemplary embodiment of the present invention. The media translation module 626 is comprised of a decoder 1110, a low pass filter 1120, and a rate converter 1130. Content packets streamed from the content provider server 140 to the MGA 120 arrive at the packet interface 430 and are delivered to the decoder 1110. The decoder 1110 is a matched type, whether proprietary or non-proprietary, for the selected content provider server 140 format type. Therefore, in an exemplary embodiment of the present invention, multiple decoder types are implemented within the media translation module 626 to accommodate selection from any of several content providers. For example, the media translation module may include decoder types to decode MP3, RealAudio, and Microsoft Media formats. Other decoder types may also be added as needed or desired. The decoder 1110 functions to receive a packet stream from the content provider server 140 and generates a decoded bit stream output; for example, a bit stream having a sampled rate of 44.1 or 48 kHz. In an exemplary embodiment of the present invention, the desired PCM signal stream output is 8 kHz. The decoder 1110 output is passed through a low pass filter 1120 to avoid difficulties associated with aliasing. The low pass filter 1120 output is then applied to a rate conversion filter (the rate converter 1130) to reduce the sampling rate to the appropriate rate (8 kHz in the instant example). One implementation of the rate converter utilizes a multi-stage filter to reduce filter length. In a practical implementation of the media translation module 626, the functions of the low pass filter 1120 and the rate converter 1130 may be implemented together as a poly-phase filter. The output of the rate converter 1130 is a PCM signal stream sent to the line driver 628 of the appropriate call channel 620 for delivery to the client cell phone 130.

One advantageous feature of the MGA 120 is that it is designed to function with current and emerging technologies (such as WAP compliant networks and cellular phones). FIG. 12 illustrates an exemplary application of the MGA 120 used in conjunction with a WAP compliant network, in accordance with the principles of the present invention. A brief description of the MGA 120 in this context follows that previously provided in conjunction with FIG. 1, with the following exceptions. Typically, for WAP compliant cellular networks, a WAP gateway 1210 is provided as a integral component of the cellular network 170. When a specified URL is requested by a WAP compliant cell phone 130, the URL is forwarded to the WAP gateway 1210, which is translated into an HTTP request.

FIG. 13 is a flow diagram illustrating an exemplary embodiment of the present invention in which the MGA 120 functions as a gateway between the Internet and the WAP compliant cellular network of FIG. 12. The client user initiates a media streaming session by requesting service (1310). The user begins this process by utilizing a WAP browser to request an audio streaming application. The WAP gateway 1210 translates the request into an HTTP request, delivered to the WAP server associated with the MGA 120 (1320). The WAP server and the MGA 120 may be implemented on the same computer or server, or alternatively, may exist on separate machines interconnected via an IP link. The MGA 120 returns a script to the client cell phone 130, the script including user-selectable options (1330). The user selects her desired options (1340) and returns the completed script to the MGA 120. The MGA 120 then instructs WAP client to enter “call accept” mode (1350). The MGA 120 then initiates a call connection to the client cell phone 130 through the MSC 150 (1360). The MGA 120 establishes a session with the content provider server 140 (1370) to initiate streaming audio. The MGA 120 receives packets of streamed audio content launched from the content provider server 140 (1380).

The MGA 120 decodes and translates the streaming packets into a PCM audio signal stream (1390) and launches the signal stream over the established call connection to the client cell phone 130 (1395).

An exemplary embodiment of the present invention was constructed as an MGA 120 prototype. The MGA prototype is implemented on a standard PC running Windows NT. The PC is equipped with line cards to terminate the circuit-switched call connection (Dialogic D240/PC1-T1 or Natural Microsystems AG4000). As an interface to the Internet, the prototype is connected via an Ethernet high-speed link.

The foregoing description merely illustrates the principles of the invention. It will thus be appreciated that those skilled in the art will be able to devise various arrangements which, although not explicitly described or shown herein, embody the principles of the invention and are included within its spirit and scope. Furthermore, all examples and conditional language recited are principally intended expressly to be only for pedagogical purposes to aid the reader in understanding the principles of the invention and the concepts contributed by the inventor(s) to furthering the art, and are to be construed as being without limitation to such specifically recited examples and conditions. Moreover, all statements herein reciting principles, aspects, and embodiments of the invention, as well as specific examples thereof, are intended to encompass both structural and functional equivalents thereof. Additionally, it is intended that such equivalents include both currently known equivalents as well as equivalents developed in the future, i.e., any elements developed that perform the same function, regardless of structure.

Thus, for example, it will be appreciated by those skilled in the art that the block diagrams herein represent conceptual views of illustrative circuitry embodying the principles of the invention. Similarly, it will be appreciated that any flow charts, flow diagrams, state transition diagrams, pseudocode, and the like represent various processes which may be substantially represented in computer readable medium and so executed by a computer or processor, whether or not such computer or processor is explicitly shown.

The functions of the various illustrated or described elements, including functional blocks labeled as "CPUs" or "processors," may be provided through the use of dedicated hardware as well as hardware capable of executing software in association with appropriate software. When provided by a processor, the functions may be provided by a single dedicated processor, by a single shared processor, or by a plurality of individual processors, some of which may be shared. Moreover, explicit use of the term "processor" or "controller" should not be construed to refer exclusively to hardware capable of executing software, and may implicitly include, without limitation, digital signal processor (DSP) hardware, read-only memory (ROM) for storing software, random access memory (RAM), and non-volatile storage. Other hardware, conventional and/or custom, may also be included.

In the claims hereof any element expressed as a means for performing a specified function is intended to encompass any way of performing that function including, for example, a) a combination of circuit elements which performs that function or b) software in any form, including, therefore, firmware, microcode or the like, combined with appropriate circuitry for executing that software to perform the function. The invention as defined by such claims resides in the fact that the functionalities provided by the various recited means are combined and brought together in the manner which the claims call for. Applicant thus regards any means which can provide those functionalities as equivalent as those shown herein.

WHAT IS CLAIMED IS:

1. A method for generating a pulse code modulated (PCM) signal stream from a plurality of streamed packets received over a packet network, said method comprising the steps of:

decoding said plurality of streamed packets to generate a decoded signal stream; and

filtering said decoded signal stream to generate said PCM signal stream.

2. The method of claim 1 wherein said step of filtering utilizes a low pass filter.

3. The method of claim 1 further comprising the step of rate converting said PCM signal stream.

4. The method of claim 3 further comprising the step of launching said PCM signal stream for transmission over a circuit-switched network.

5. The method of claim 4 wherein said circuit-switched network is a cellular network.

6. The method of claim 5 wherein said packet network is an IP-based network.

7. The method of claim 6 wherein said PCM signal stream is a media signal stream.

8. The method of claim 7 wherein said media signal stream is an audio signal stream.

9. The method of claim 7 wherein said media signal stream is a video signal stream.

10. The method of claim 7 wherein said media signal stream is a text signal stream.

11. The method of claim 5 wherein said packet network is the Internet.

12. A method for generating a pulse code modulated (PCM) streamed audio signal from a plurality of streamed packets received from an Internet content provider server over the Internet, said PCM streamed audio signal suitable for conveyance over a circuit-switched call connection, said method comprising the steps of:

receiving said plurality of streamed packets;

decoding said plurality of streamed packets to generate a decoded signal stream;

converting the bit rate of said decoded signal stream to generate a converted signal stream compatible with said circuit-switched call connection; and

filtering said converted signal stream to generate said PCM streamed audio signal.

13. The method of claim 12 wherein said circuit-switched call connection is provided over a wireless network.

14. The method of claim 13 wherein said wireless network is a cellular network.

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15. The method of claim 14 wherein said cellular network is a time division multiple access (TDMA) network.

16. The method of claim 14 wherein said cellular network is a code division multiple access (CDMA) network.

17. The method of claim 14 wherein said cellular network is a Groupe Speciale Mobile (GSM) network.

18. An apparatus for generating a pulse code modulated (PCM) streamed audio signal from a plurality of streamed packets received from an Internet content provider server over the Internet, said PCM streamed audio signal suitable for conveyance over a circuit-switched call connection, said apparatus comprising:

means for receiving said plurality of streamed packets;

means for decoding said plurality of streamed packets to generate a decoded signal stream;

means for converting the bit rate of said decoded signal stream to generate a converted signal stream compatible with said circuit-switched call connection; and

means for filtering said converted signal stream to generate said PCM streamed audio signal.

19. The apparatus of claim 18 wherein said circuit-switched call connection is provided over a wireless network.

20. The apparatus of claim 19 wherein said wireless network is a cellular network.

21. An apparatus for generating a pulse code modulated (PCM) streamed audio signal from a plurality of streamed packets received from an Internet content provider server over the Internet, said PCM streamed audio signal suitable for conveyance over a circuit-switched call connection, said apparatus comprising:

a packet interface for receiving said plurality of streamed packets;

a decoder for decoding said plurality of streamed packets to generate a decoded signal stream;

a rate converter for converting the bit rate of said decoded signal stream to generate a converted signal stream compatible with said circuit-switched call connection; and

a filter for filtering said converted signal stream to generate said PCM streamed audio signal.

22. The apparatus of claim 21 wherein said rate converter converts the bit rate of said decoded signal stream to 64 kbps.

23. The apparatus of claim 21 wherein said circuit-switched call connection is provided over a wireless network.

24. The apparatus of claim 23 wherein said wireless network is a cellular network.

25. The apparatus of claim 21 wherein said filter is a low pass filter.

26. The apparatus of claim 25 wherein said low pass filter is utilized to prevent aliasing.

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27. An apparatus for generating a pulse code modulated (PCM) streamed audio signal from a plurality of streamed packets received from an Internet content provider server over the Internet, said PCM streamed audio signal suitable for conveyance over a circuit-switched call connection, said apparatus comprising:

a packet interface for receiving said plurality of streamed packets;

a processor; and

a memory coupled to said processor and including instructions for controlling said processor,

said processor operative with said instructions in said memory to;

decode said plurality of streamed packets to generate a decoded signal stream;

convert the bit rate of said decoded signal stream to generate a converted signal stream compatible with said circuit-switched call connection; and

filter said converted signal stream to generate said PCM streamed audio signal.

28. An apparatus for generating a pulse code modulated (PCM) signal stream from a plurality of streamed packets received over a packet network, said apparatus comprising:

means for decoding said plurality of streamed packets to generate a decoded signal stream; and

means for filtering said decoded signal stream to generate said PCM signal stream.

29. The apparatus of claim 28 wherein said means for filtering is a low pass filter.

29. The apparatus of claim 28 wherein said low pass filter is utilized to prevent aliasing.

30. The apparatus of claim 28 further comprising a switched-circuit interface for transmitting said PCM signal stream over a circuit-switched call connection.

31. The apparatus of claim 28 wherein said packet network is an IP-based network.

32. The apparatus of claim 28 wherein said packet network is the Internet.

33. The apparatus of claim 28 wherein said PCM signal stream is a media signal stream.

34. The apparatus of claim 33 wherein said media signal stream is an audio signal stream.

35. The apparatus of claim 33 wherein said media signal stream is a video signal stream.

36. The apparatus of claim 33 wherein said media signal stream is streaming text.

37. An apparatus for generating a pulse code modulated (PCM) signal stream from a plurality of streamed packets received over a packet network, said apparatus comprising:

a decoder for decoding said plurality of streamed packets to generate a decoded signal stream; and

a filter for filtering said decoded signal stream to generate said PCM signal stream.

38. The apparatus of claim 37 wherein said filter is a low pass filter.

39. The apparatus of claim 38 wherein said low pass filter is utilized to prevent aliasing.

40. An apparatus for generating a pulse code modulated (PCM) signal stream from a plurality of streamed packets received over a packet network, said apparatus comprising:

a processor; and

a memory coupled to said processor and including instructions for controlling said processor,

said processor operative with said instructions in said memory to;

decode said plurality of streamed packets to generate a decoded signal stream; and

translate said decoded signal stream into said PCM streamed audio signal.

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ABSTRACT OF THE DISCLOSURE

A method and device are disclosed which receives packets streamed over a packet network, decodes the packets received to generate a decoded signal stream and filters the decoded signal stream to generate a pulse code modulated (PCM) signal stream. The PCM signal stream may be tailored to conform to the target destination transport requirements, including call channels established over circuit-switched networks, whether wired or wireless, without modifying the capabilities associated with the network infrastructure or the client phone.

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FIG. 1

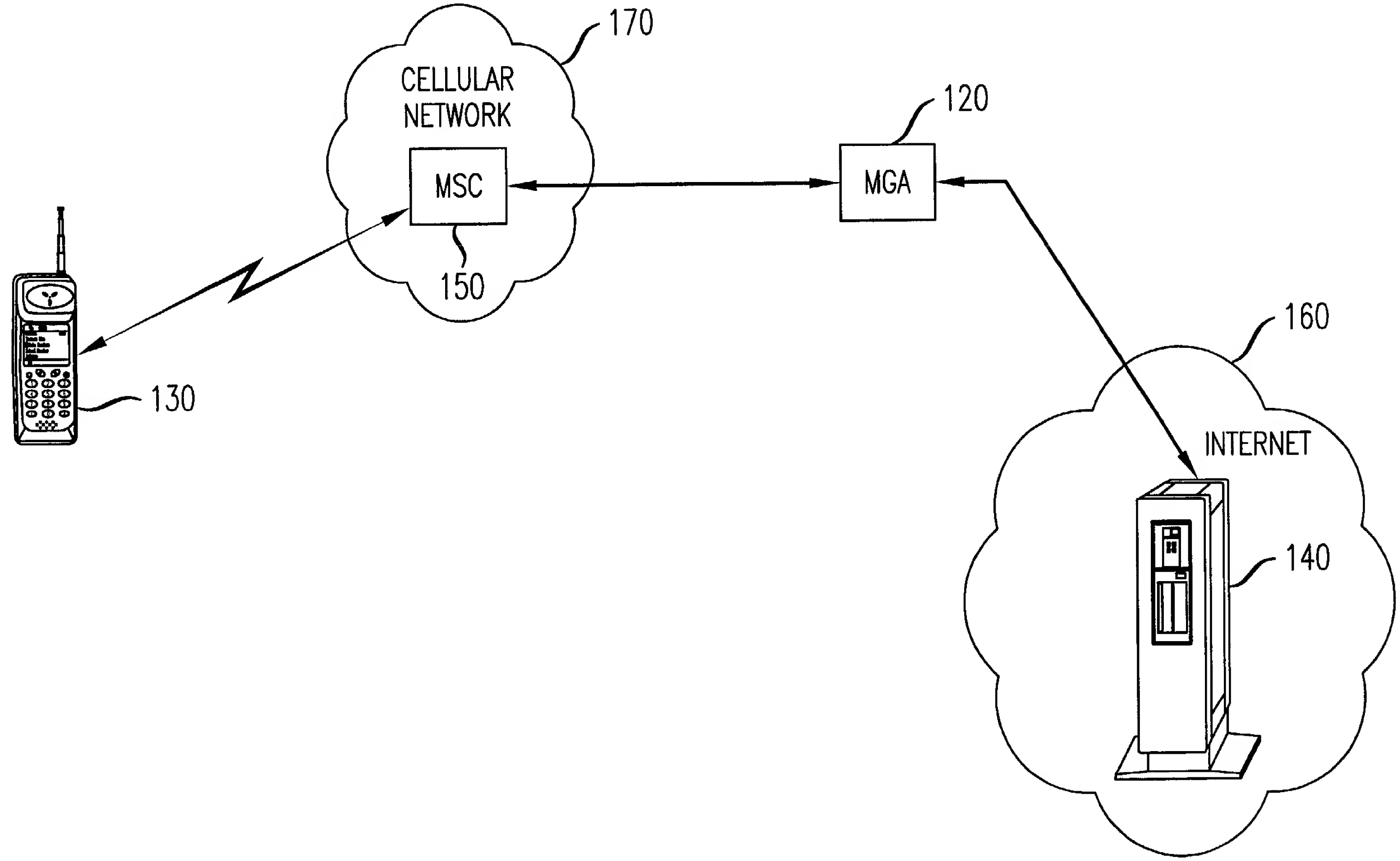
170
CELLULAR NETWORK
MSC
150
120
MGA
130
160
INTERNET
140

FIG. 2

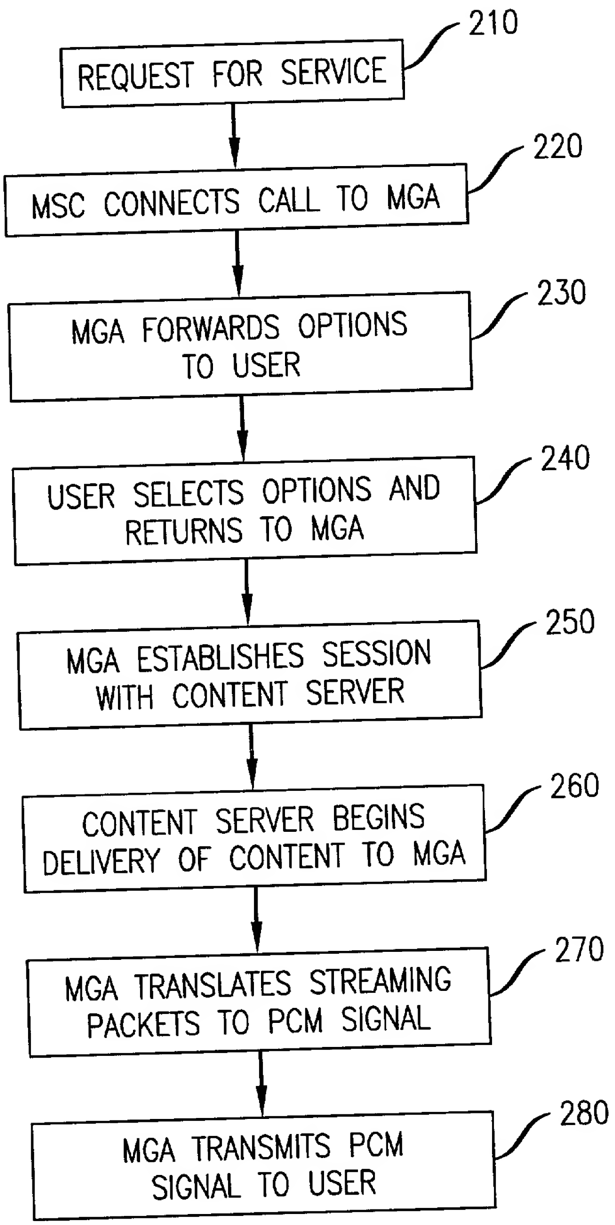
210
REQUEST FOR SERVICE
220
MSC CONNECTS CALL TO MGA
230
MGA FORWARDS OPTIONS TO USER
240
USER SELECTS OPTIONS AND RETURNS TO MGA
250
MGA ESTABLISHES SESSION WITH CONTENT SERVER
260
CONTENT SERVER BEGINS DELIVERY OF CONTENT TO MGA
270
MGA TRANSLATES STREAMING PACKETS TO PCM SIGNAL
280
MGA TRANSMITS PCM SIGNAL TO USER

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FIG. 3

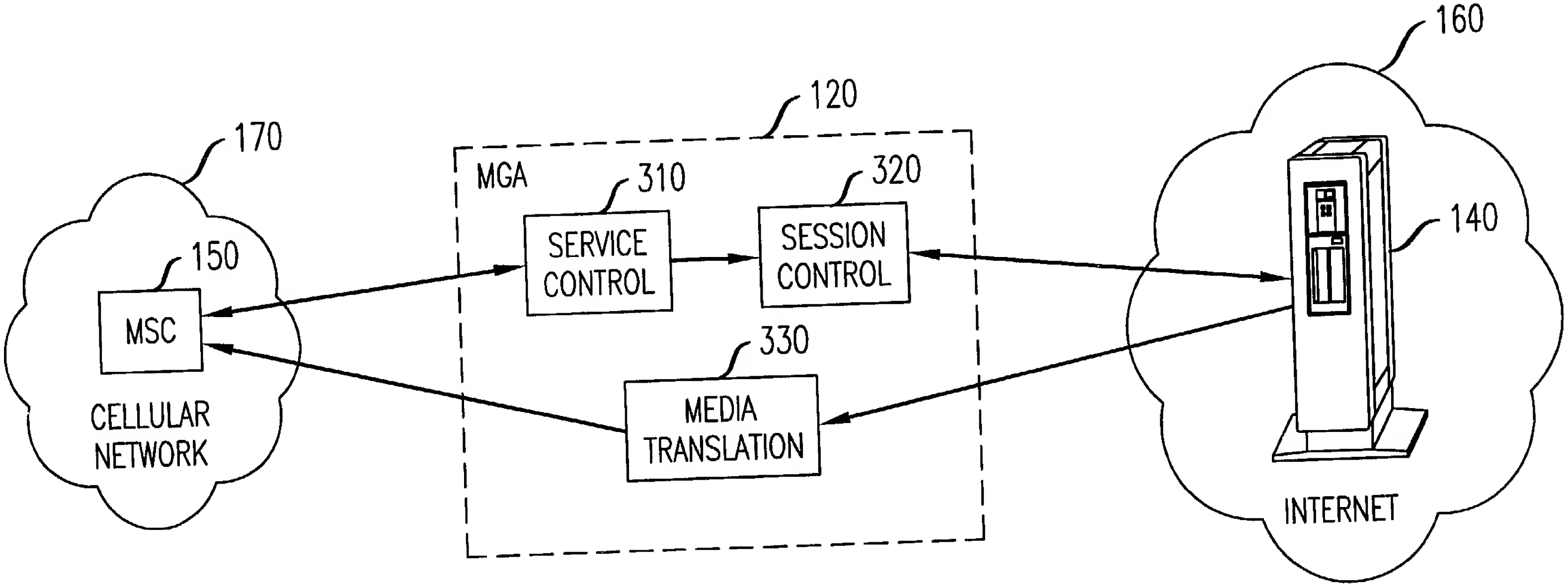
170
150
MSC
CELLULAR NETWORK
120
MGA
310
SERVICE CONTROL
320
SESSION CONTROL
330
MEDIA TRANSLATION
160
140
INTERNET

FIG. 4

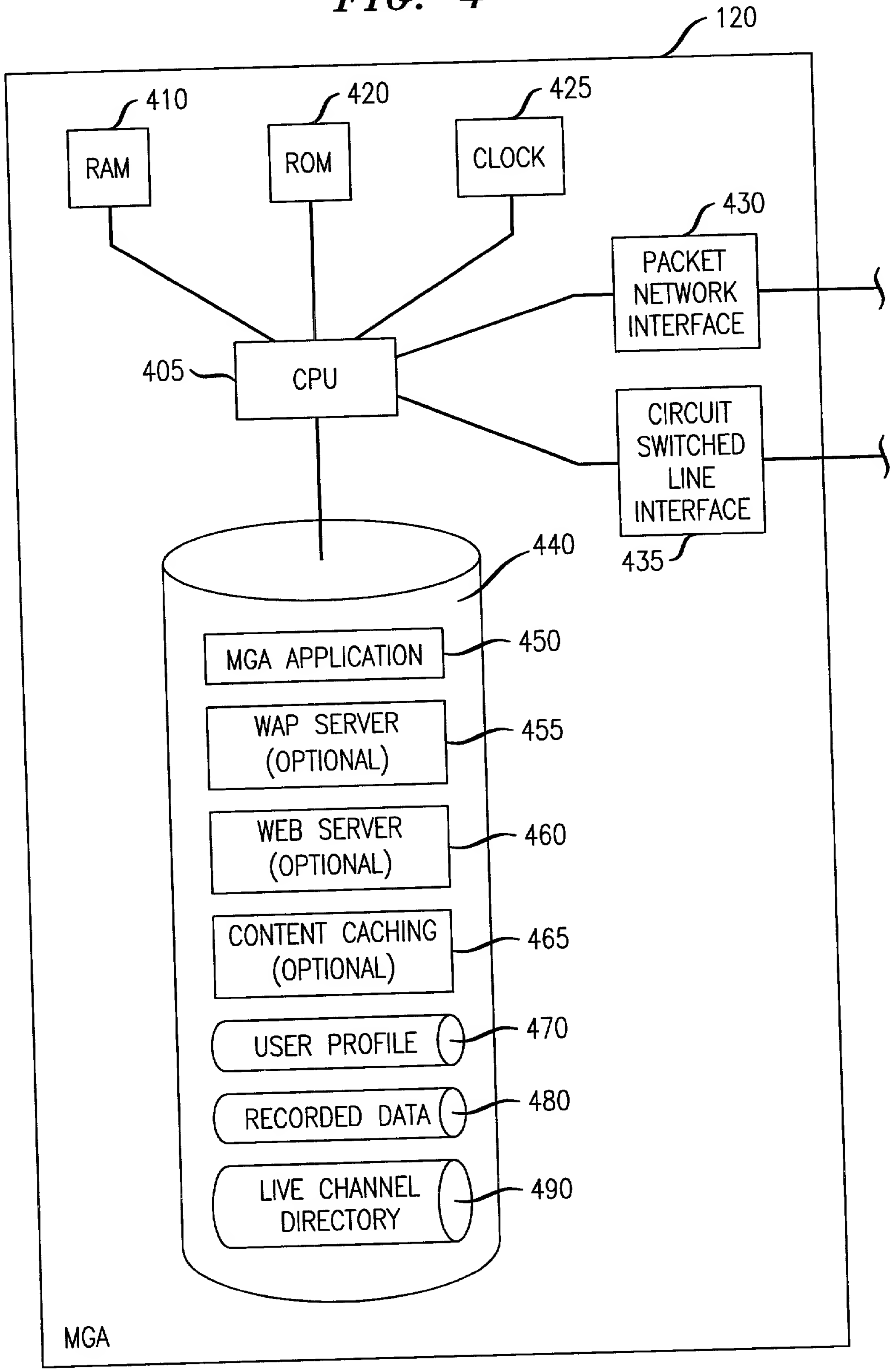
120
410
RAM
420
ROM
425
CLOCK
430
PACKET NETWORK INTERFACE
405
CPU
CIRCUIT SWITCHED LINE INTERFACE
435
440
MGA APPLICATION
450
WAP SERVER (OPTIONAL)
455
WEB SERVER (OPTIONAL)
460
CONTENT CACHING (OPTIONAL)
465
USER PROFILE
470
RECORDED DATA
480
LIVE CHANNEL DIRECTORY
490
MGA

FIG. 5

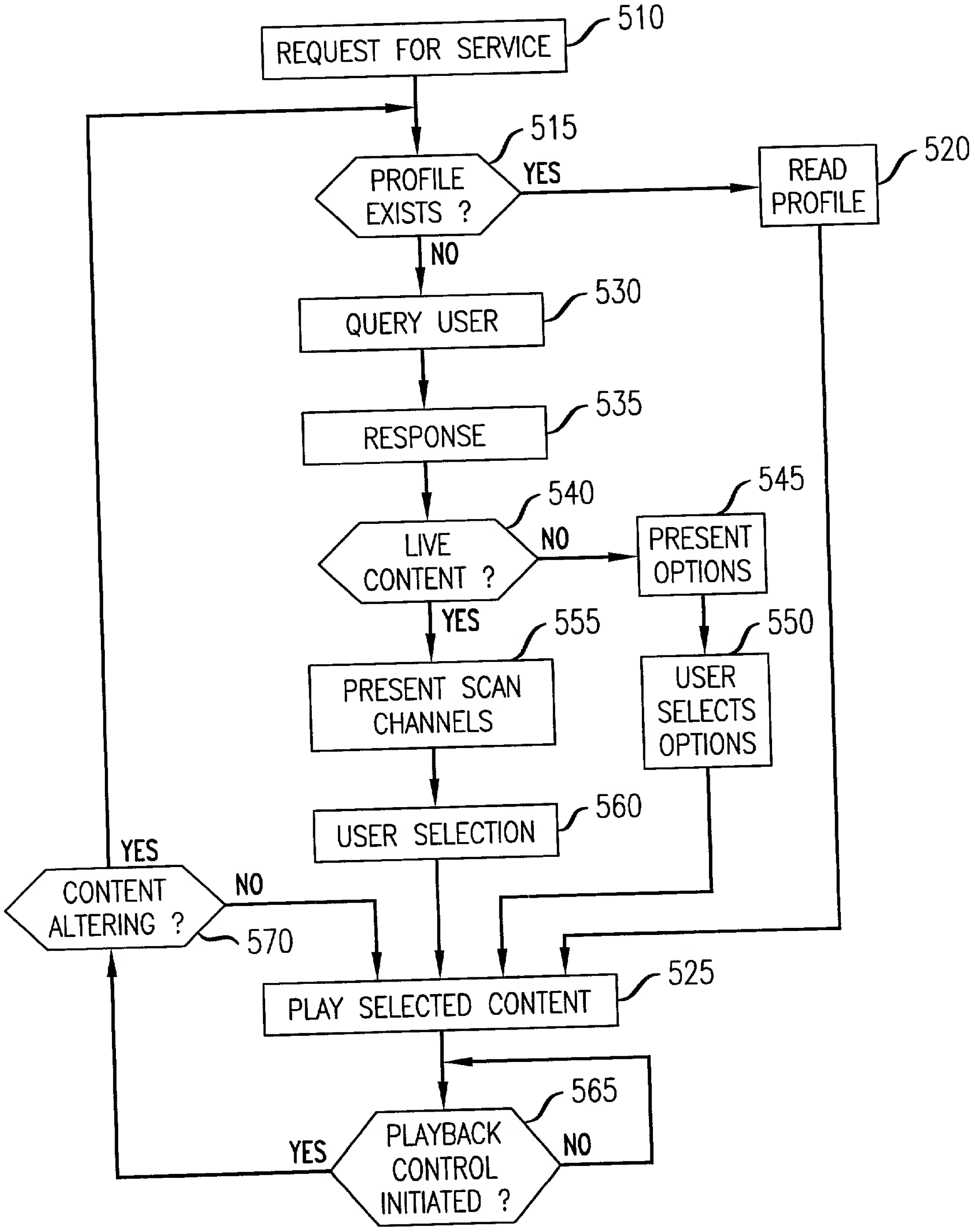
REQUEST FOR SERVICE
510
PROFILE EXISTS ?
515
YES
READ PROFILE
520
NO
QUERY USER
530
RESPONSE
535
LIVE CONTENT ?
540
NO
PRESENT OPTIONS
545
YES
PRESENT SCAN CHANNELS
555
USER SELECTS OPTIONS
550
USER SELECTION
560
YES
CONTENT ALTERING ?
NO
570
PLAY SELECTED CONTENT
525
PLAYBACK CONTROL INITIATED ?
565
YES
NO

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FIG. 6

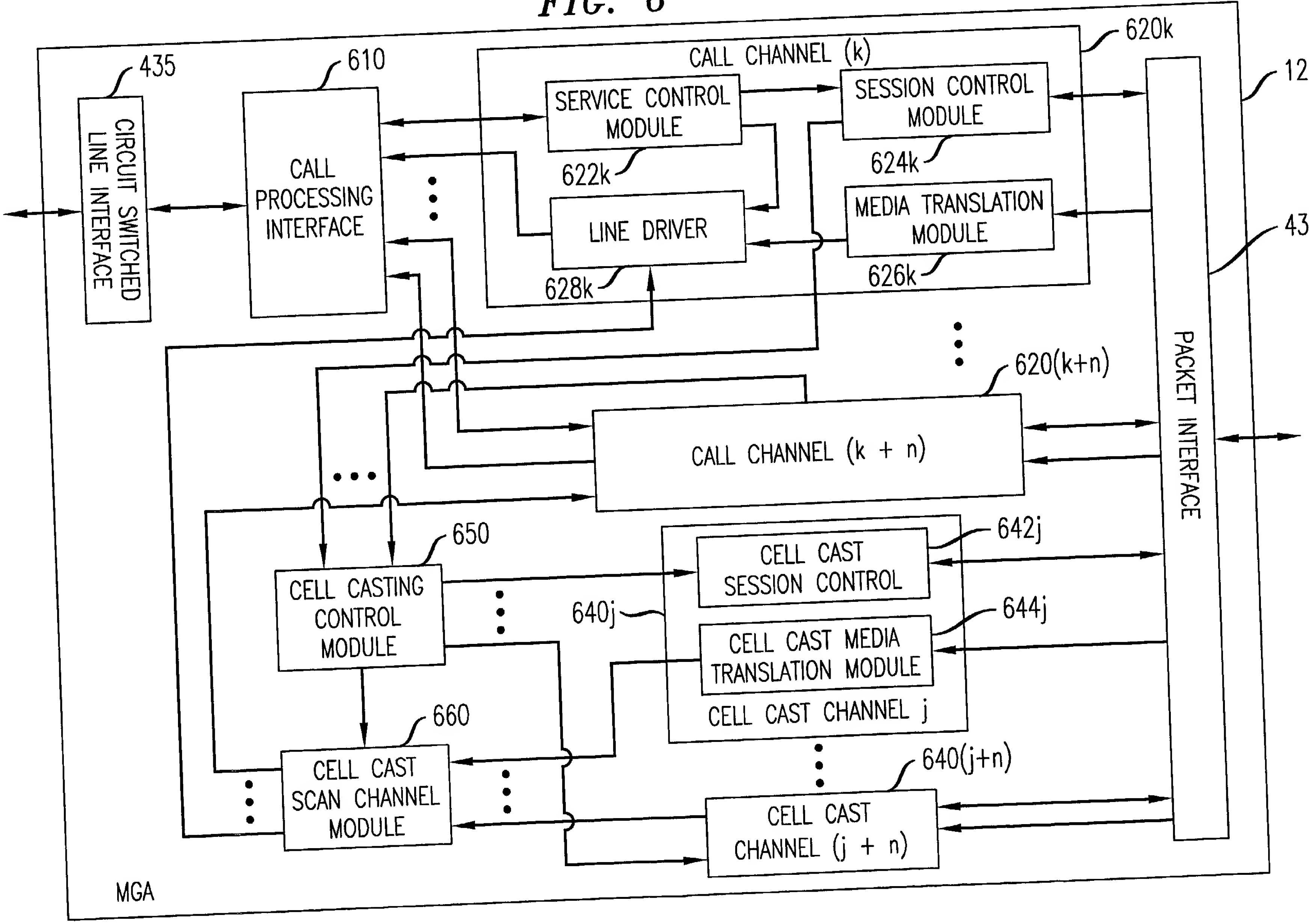
435
CIRCUIT SWITCHED LINE INTERFACE
610
CALL PROCESSING INTERFACE
CALL CHANNEL (k)
620k
SERVICE CONTROL MODULE
622k
SESSION CONTROL MODULE
624k
LINE DRIVER
628k
MEDIA TRANSLATION MODULE
626k
120
430
PACKET INTERFACE
620(k+n)
CALL CHANNEL (k + n)
650
CELL CASTING CONTROL MODULE
660
CELL CAST SCAN CHANNEL MODULE
640j
642j
CELL CAST SESSION CONTROL
644j
CELL CAST MEDIA TRANSLATION MODULE
CELL CAST CHANNEL j
640(j+n)
CELL CAST CHANNEL (j + n)
MGA

FIG. 7

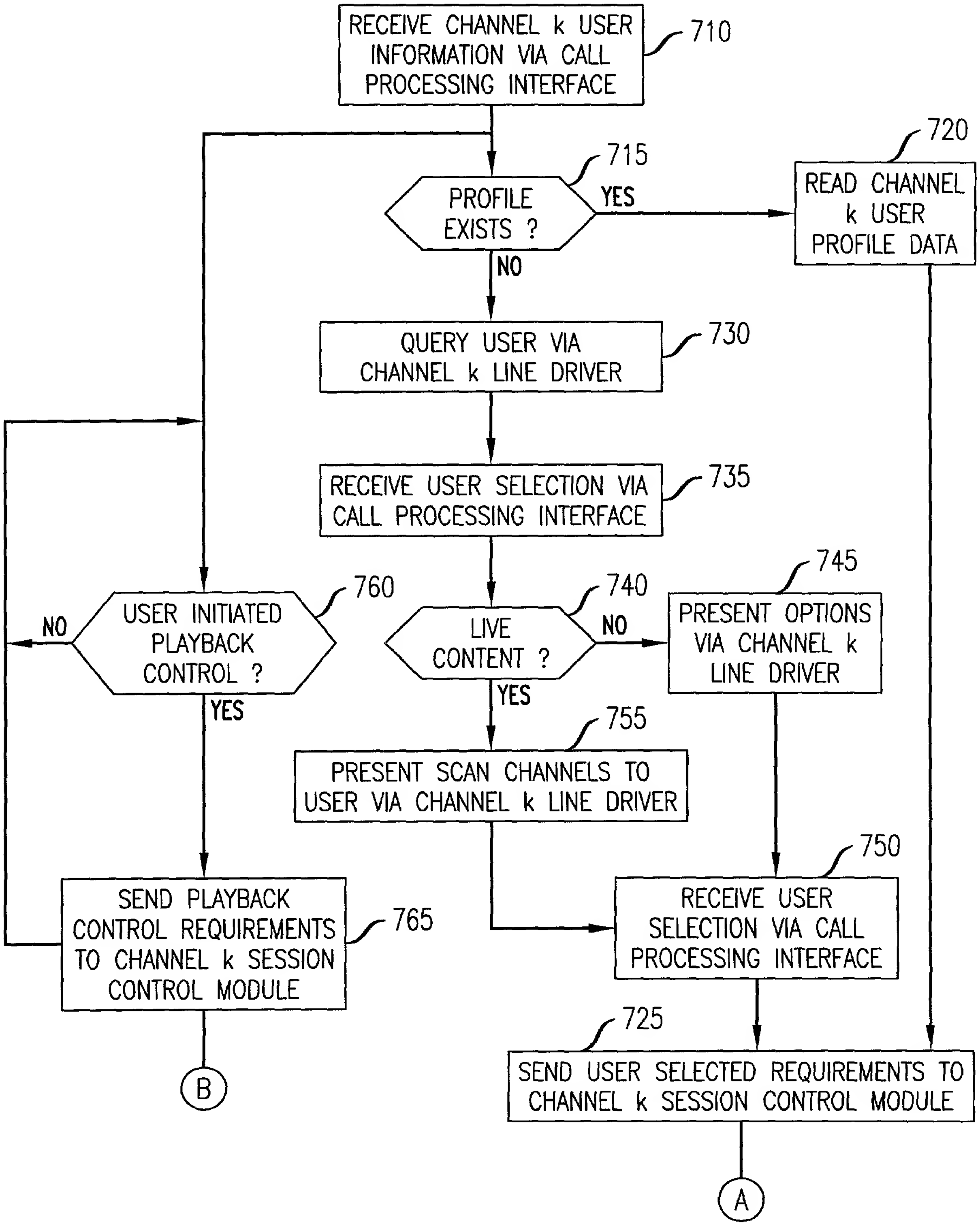
RECEIVE CHANNEL k USER INFORMATION VIA CALL PROCESSING INTERFACE
710
PROFILE EXISTS ?
715
YES
READ CHANNEL k USER PROFILE DATA
720
NO
QUERY USER VIA CHANNEL k LINE DRIVER
730
RECEIVE USER SELECTION VIA CALL PROCESSING INTERFACE
735
USER INITIATED PLAYBACK CONTROL ?
760
NO
YES
LIVE CONTENT ?
740
NO
PRESENT OPTIONS VIA CHANNEL k LINE DRIVER
745
YES
PRESENT SCAN CHANNELS TO USER VIA CHANNEL k LINE DRIVER
755
RECEIVE USER SELECTION VIA CALL PROCESSING INTERFACE
750
SEND PLAYBACK CONTROL REQUIREMENTS TO CHANNEL k SESSION CONTROL MODULE
765
B
SEND USER SELECTED REQUIREMENTS TO CHANNEL k SESSION CONTROL MODULE
725
A

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FIG. 8

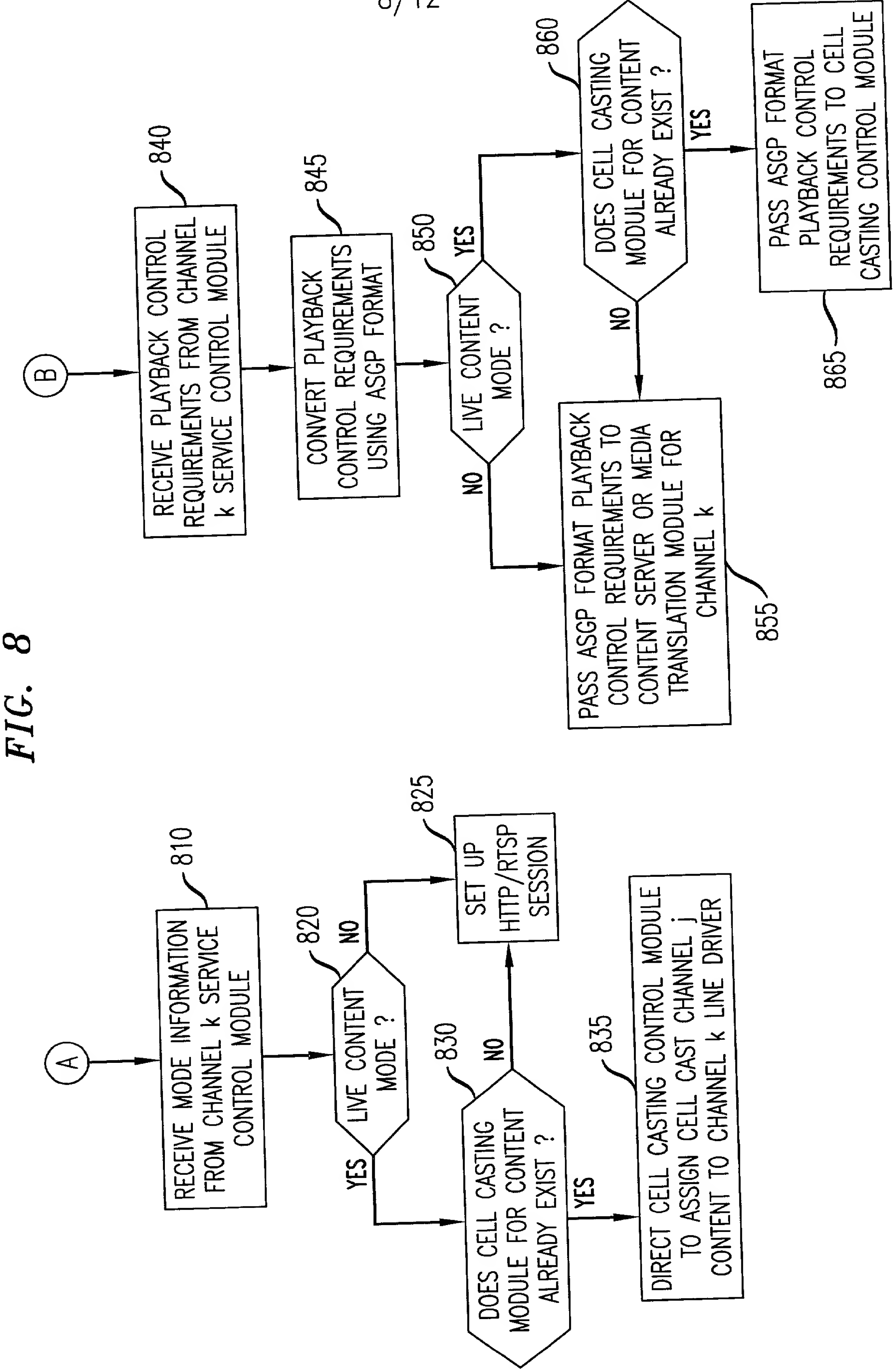
A
RECEIVE MODE INFORMATION FROM CHANNEL k SERVICE CONTROL MODULE
810
LIVE CONTENT MODE ?
820
NO
SET UP HTTP/RTSP SESSION
825
YES
DOES CELL CASTING MODULE FOR CONTENT ALREADY EXIST ?
830
NO
YES
DIRECT CELL CASTING CONTROL MODULE TO ASSIGN CELL CAST CHANNEL j CONTENT TO CHANNEL k LINE DRIVER
835
B
RECEIVE PLAYBACK CONTROL REQUIREMENTS FROM CHANNEL k SERVICE CONTROL MODULE
840
CONVERT PLAYBACK CONTROL REQUIREMENTS USING ASGP FORMAT
845
LIVE CONTENT MODE ?
850
YES
NO
PASS ASGP FORMAT PLAYBACK CONTROL REQUIREMENTS TO CONTENT SERVER OR MEDIA TRANSLATION MODULE FOR CHANNEL k
855
DOES CELL CASTING MODULE FOR CONTENT ALREADY EXIST ?
860
NO
YES
PASS ASGP FORMAT PLAYBACK CONTROL REQUIREMENTS TO CELL CASTING CONTROL MODULE
865

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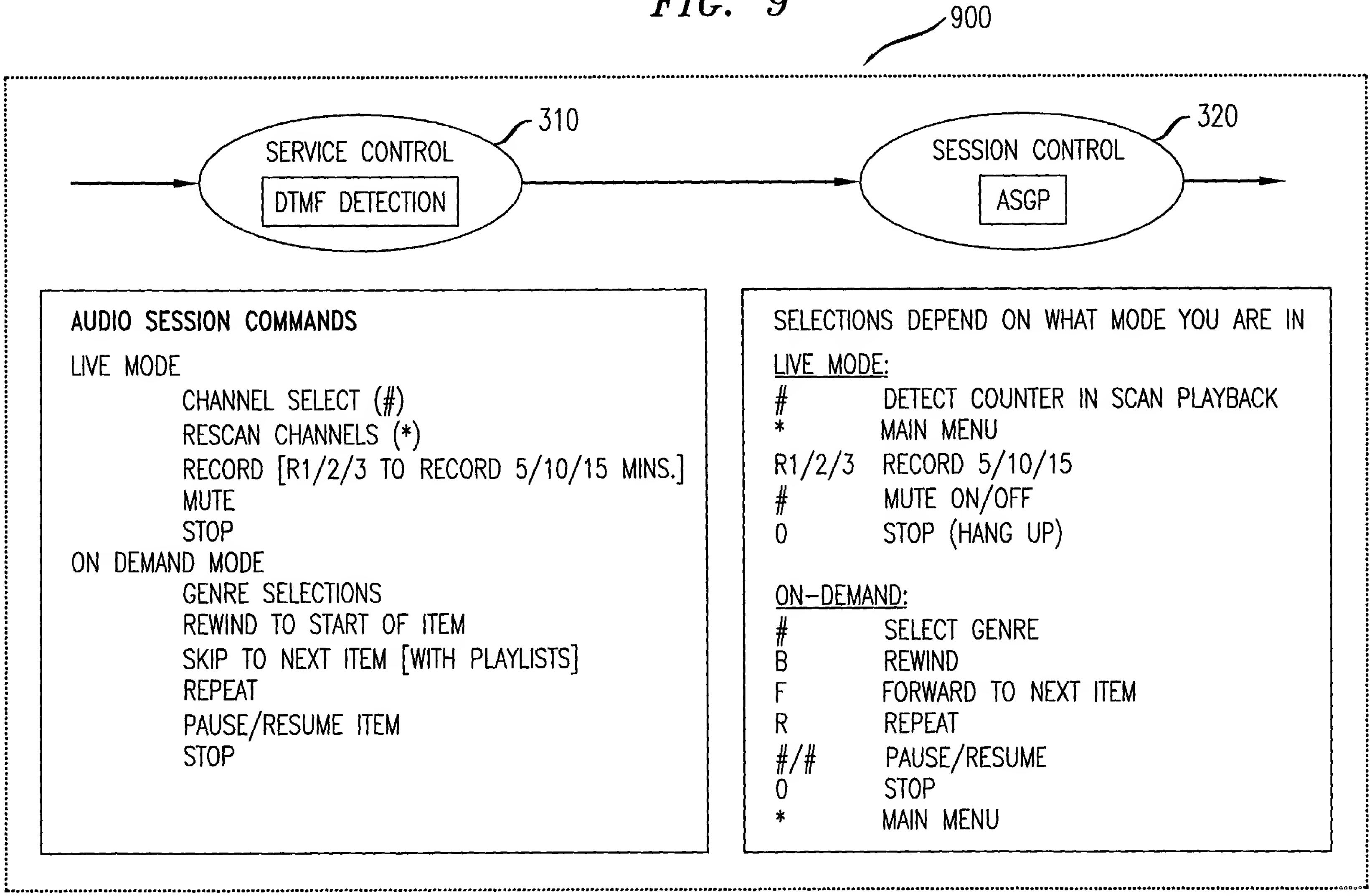
FIG. 9


900
310
SERVICE CONTROL
DTMF DETECTION
320
SESSION CONTROL
ASGP

AUDIO SESSION COMMANDS

LIVE MODE
- CHANNEL SELECT (#)
- RESCAN CHANNELS (*)
- RECORD [R1/2/3 TO RECORD 5/10/15 MINS.]
- MUTE
- STOP

ON DEMAND MODE
- GENRE SELECTIONS
- REWIND TO START OF ITEM
- SKIP TO NEXT ITEM [WITH PLAYLISTS]
- REPEAT
- PAUSE/RESUME ITEM
- STOP

SELECTIONS DEPEND ON WHAT MODE YOU ARE IN

LIVE MODE:

#	DETECT COUNTER IN SCAN PLAYBACK
*	MAIN MENU
R1/2/3	RECORD 5/10/15
#	MUTE ON/OFF
0	STOP (HANG UP)

ON-DEMAND:

#	SELECT GENRE
B	REWIND
F	FORWARD TO NEXT ITEM
R	REPEAT
#/#	PAUSE/RESUME
0	STOP
*	MAIN MENU

FIG. 10

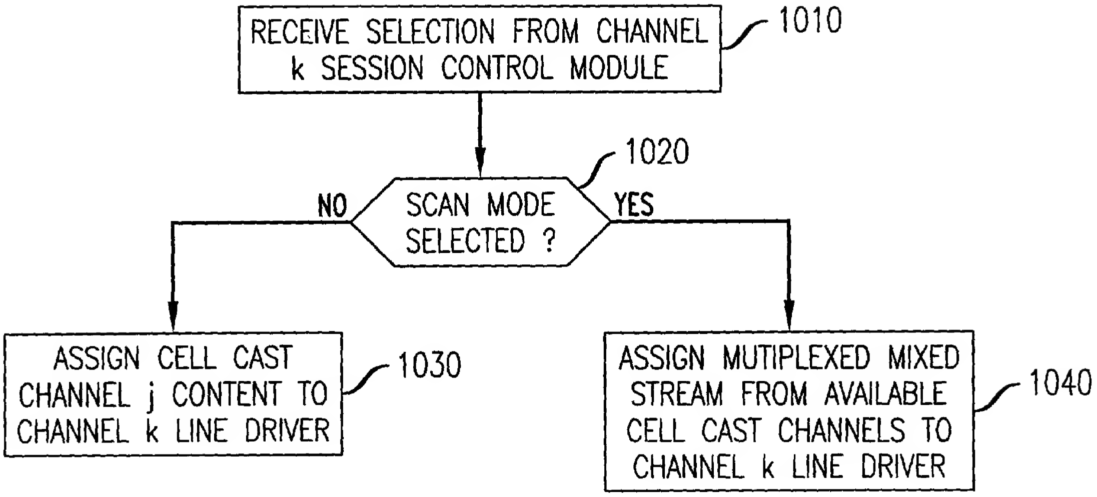

RECEIVE SELECTION FROM CHANNEL k SESSION CONTROL MODULE
1010
SCAN MODE SELECTED ?
1020
NO
YES
ASSIGN CELL CAST CHANNEL j CONTENT TO CHANNEL k LINE DRIVER
1030
ASSIGN MUTIPLEXED MIXED STREAM FROM AVAILABLE CELL CAST CHANNELS TO CHANNEL k LINE DRIVER
1040

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FIG. 11

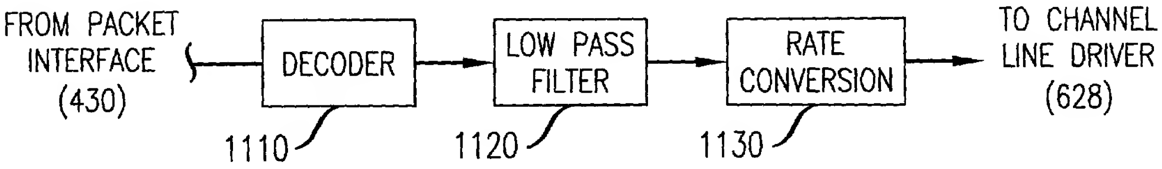
FROM PACKET INTERFACE (430)
DECODER
1110
LOW PASS FILTER
1120
RATE CONVERSION
1130
TO CHANNEL LINE DRIVER (628)

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FIG. 12

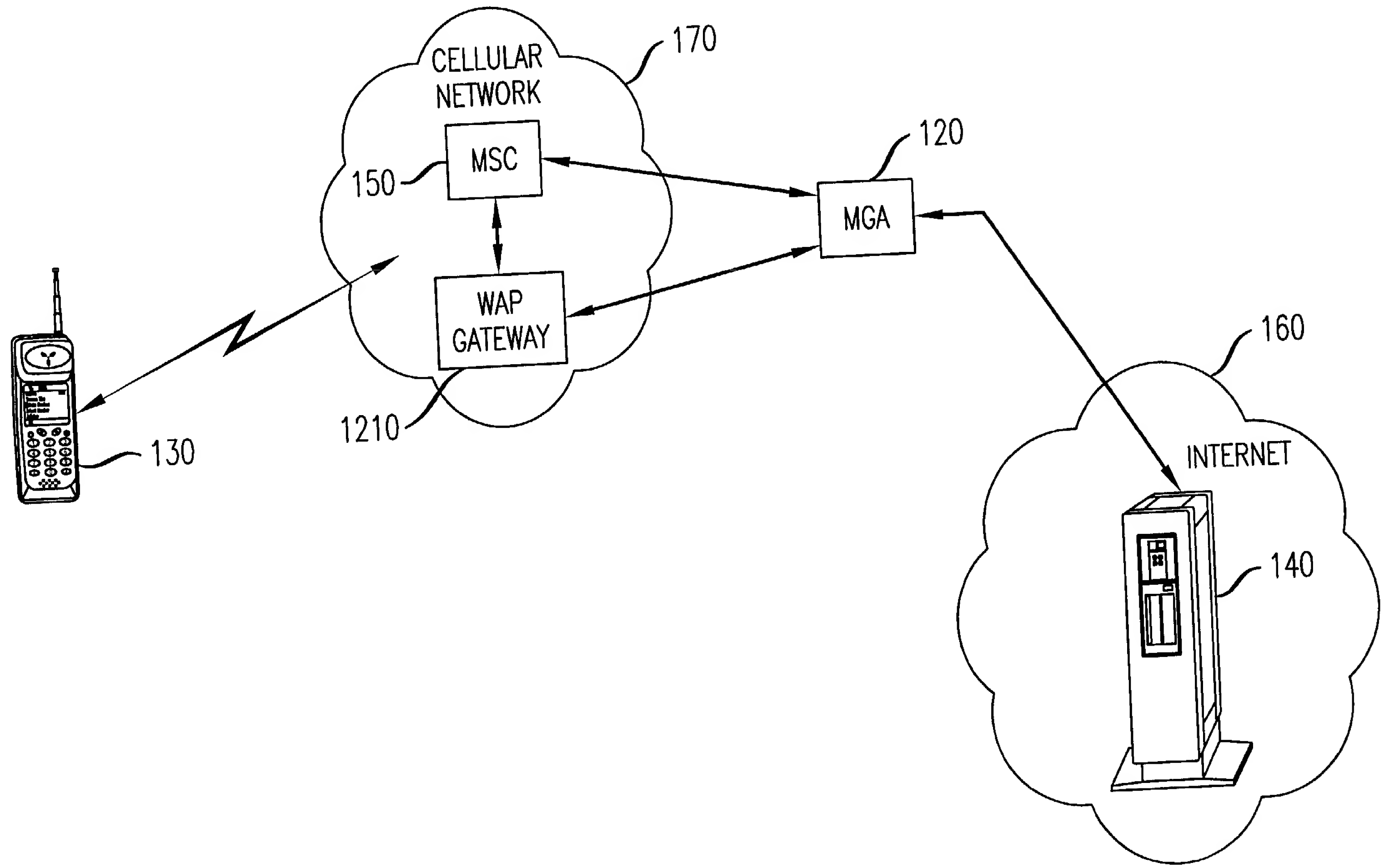
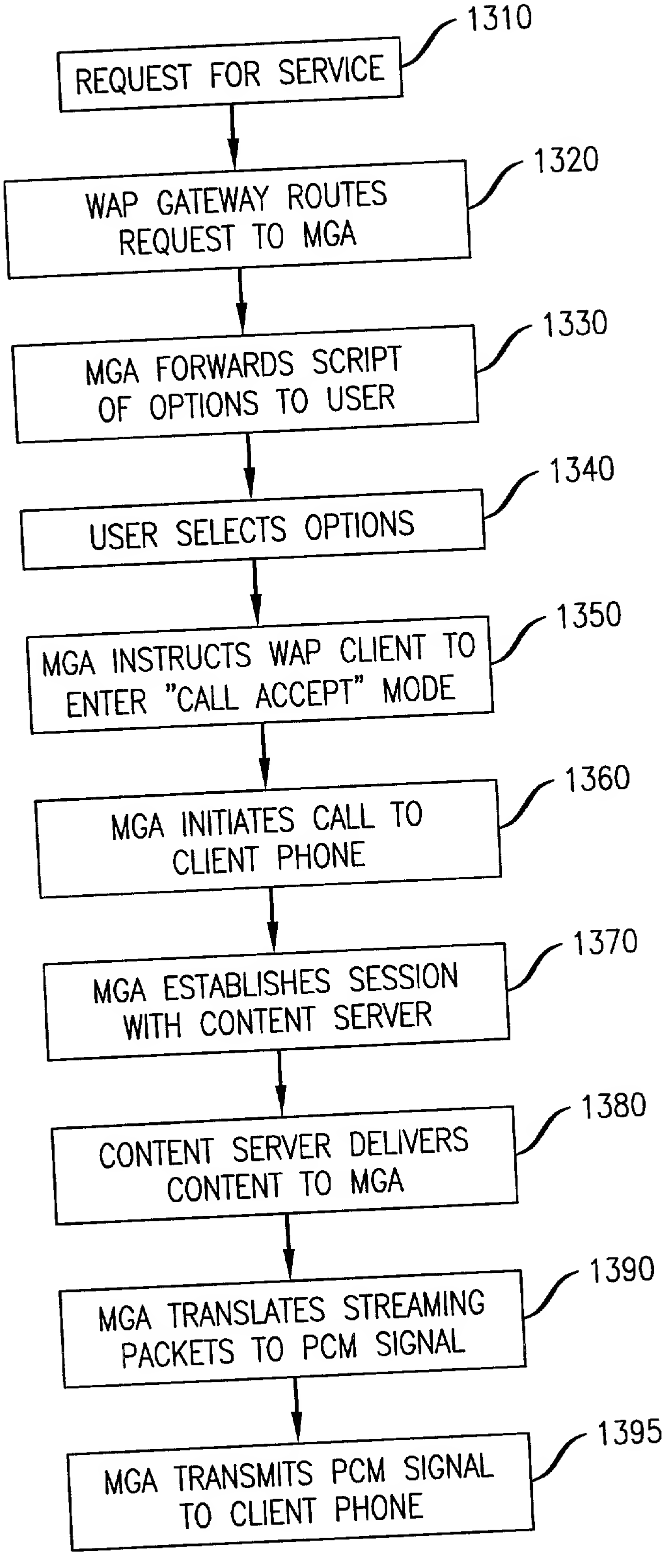

CELLULAR
NETWORK
170
MSC
150
WAP
GATEWAY
1210
MGA
120
130
160
INTERNET
140

FIG. 13


REQUEST FOR SERVICE
1310
WAP GATEWAY ROUTES REQUEST TO MGA
1320
MGA FORWARDS SCRIPT OF OPTIONS TO USER
1330
USER SELECTS OPTIONS
1340
MGA INSTRUCTS WAP CLIENT TO ENTER "CALL ACCEPT" MODE
1350
MGA INITIATES CALL TO CLIENT PHONE
1360
MGA ESTABLISHES SESSION WITH CONTENT SERVER
1370
CONTENT SERVER DELIVERS CONTENT TO MGA
1380
MGA TRANSLATES STREAMING PACKETS TO PCM SIGNAL
1390
MGA TRANSMITS PCM SIGNAL TO CLIENT PHONE
1395

IN THE UNITED STATES
PATENT AND TRADEMARK OFFICE

Declaration and Power of Attorney

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I hereby claim the benefit under Title 35, United States Code, 119(e) of any United States provisional application(s) identified below:

Provisional application No. 60/180245, filed on February 4, 2000.

I believe I am an original, first and sole inventor of the subject matter which is claimed and for which a patent is sought on the invention entitled **Method And Device For Generating A PCM Signal Stream From A Streaming Packet Source,** the specification of which is attached hereto.

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by an amendment, if any, specifically referred to in this oath or declaration.

I acknowledge the duty to disclose all information known to me which is material to patentability as defined in Title 37, Code of Federal Regulations, 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, 119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

None

I hereby claim the benefit under Title 35, United States Code, 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, 112, I acknowledge the duty to disclose all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application:

None

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States

Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

I hereby appoint the following attorney(s) with full power of substitution and revocation, to prosecute said application, to make alterations and amendments therein, to receive the patent, and to transact all business in the Patent and Trademark Office connected therewith:

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